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DEVELOPMENT OBJECTIVE

AN ADVANCED TILT TOP LIGHT TABLE

1. INTRODUCTION.

These development objectives describe the requirements to be met in the designing of an Advanced Tilt Top Light Table. This table is intended as a replacement for contemporary tables which tend to be awkward and uncomfortable to use. They provide inadequate light and, in most instances, require the operator to adjust to the limitations of the table rather than adjusting the table to the operator.

2. CONCEPT.

This table is intended to provide ease of viewing, increased illumination, easy loading and a superior film transport system. It is to be as light, compact and simple in mechanical design as is possible within the parameters imposed by the specific requirements stated in these objectives.

3. GENERAL DESCRIPTION.

This table shall provide a 11" by 18" illuminated area for use in viewing single rolls of 9½", 5" or 70mm film, or dual rolls of either 5" or 70mm film, concurrently. The light table in tilted configuration will normally be positioned facing the operator on the front or forward edge of a low, fixed or elevating table. The viewing surface will normally be tilted about the center of the shorter axis of the light box; however, the table may be used in a horizontal position or tilted about the long axis of the table.

4. REQUIREMENTS.

4.1. Illumination System

4.1.1. Intensity.

4.1.1.1. Range. The illumination system must provide at least 1500 foot lamberts, (measured at the illumination surface) with 1800 foot lamberts a definite design goal. This illumination shall not vary by more than 10% between any two points within the entire illuminated surface area.

4.1.1.2. Variability. The illumination intensity shall be continuously variable throughout a range of from 15% to 100% of full intensity without evidence of "flicker."

4.1.2. Heat. The light table must be able to be operated continuously at maximum intensity over a 24 hour period in a room with an 80°F ambient temperature, without exceeding 110° on any external surface.

4.1.3. Diffuser. An opal glass or similar diffuser shall be located between the glass top and the light source.

4.1.4. Shades. Adjustable shades must be provided to block out all of the illuminated surface not actually covered by the film. Each of these shades must be located beneath the surface glass, mounted along the long dimension of the unit and extendable across the short dimension. This extensibility must be continuously variable between a minimum extension of (0) zero inches and a maximum extension of 9 inches. These shades must not encroach upon the illuminated viewing area when retracted and, in addition, must be lockable in any extended or retracted position.

4.2. External Configuration.

4.2.1. Size. The entire unit shall not exceed 32" in length and 16" in width. Width is exclusive of crank handles. The overall height of the table shall not exceed 9" when in the horizontal position. This is the height excluding the film spools.

4.2.2. Weight. The unit must be as light as possible commensurate with that weight which is necessary to maintain good stability and to balance the table in any of its tilted positions.

4.3. Spool Loading and Holding Mechanism.

4.3.1. Loading Mechanism. A loading mechanism must be provided for the fast loading and unloading of single spools of $9\frac{1}{2}$", 5" and 70mm film or dual rolls of either 5" or 70mm. These rolls will range up to and including 500 feet in capacity. The loading system must be both quick and easy to operate and at the same time positive in action; i.e. it must not drop the heaviest full spool ($9\frac{1}{2}$", 500 ft.) no matter what the degree of tilt of the table or how fast or hard the film is cranked. A drop-in film loading device is one possibility.

4.3.2. Holding Mechanism. The holding mechanism which engages and secures the spool must be designed for easy one hand operation so that the film can be held in one hand while the holding mechanism is activated with the other. A positive but quick release lock must be provided on this securing device.

4.4. Film Transport.

4.4.1. General. The film transport system must be unique in that it shall permit bi-directional film motion controllable from either end, i.e., it will permit both winding and unwinding with the same crank at one end of the table. This transport system may be either mechanical or electro-mechanical; however, basic simplicity of design and complete reliability are mandatory; consequently a purely mechanical system is more desirable.

4.4.2. Film Capacity. The film transport system must be able to accommodate either single rolls of $9\frac{1}{2}$", 5" or 70mm wide film on either partially or fully loaded spools of up to and including 500 feet capacity. In addition, provision must be made for handling dual rolls of either 5" or 70mm film simultaneously. These rolls should be mounted side by side with a supporting post in between.

4.4.3. Film Direction. Film spools shall be located at the ends of the long dimension of the viewing area, with the film or films transported along and parallel to the long axis of the light table. When dual rolls are used, the film strips will travel parallel to each other and to the long axis of the table, with a minimum of separation between strips.

4.4.4. Rollers. Rollers must be designed so that film can be transported with either emulsion up or emulsion down without scratching either the emulsion or the base of the film. The rollers must be either segmented

or some alternative system provided so that when dual rolls of film are used, alternate rolls of film can be wound in opposite directions concurrently or one of the dual rolls translated while the other roll remains stationary.

4.4.5. Film Tension. The film transport mechanism must maintain a light, constant, even tension on the film or films -- just enough tension to keep the film flat and in contact with the plate glass surface when the film is not being transported. This tension should be automatically reduced (eased) when the film is transported.

4.4.6. Film Drive. The film drive must provide a means of winding and unwinding single rolls of 9½", 5" or 70mm wide film or dual rolls of either 5" or 70mm film. The drive must provide the ability to wind one of the dual rolls while unwinding the alternate roll or, for instance, permit one film roll to remain stationary while the other roll is translated. The drive control may be a hand crank or electric switch; however, if an electric control is used, it must permit the same degree of control sensitivity as a hand crank. If an electric drive is proposed, an additional high or "slew" speed must be provided. If a mechanical system is proposed, a two speed mechanical gear shift or electrical slew with a mechanical hand crank override will be required. In all cases, reliability of operation is mandatory. Each individual hand crank must provide very smooth winding and unwinding of film from either its own spool or the spool at the other end (long axis) of the table. The drive must be a low friction system incorporating inertia damping and antibacklash control. The efficiency, reliability, and ease of operation of this drive system is the most important single consideration in these development objectives.

4.5. Tilt Mechanism.

4.5.1. Amount and Direction of Tilt. The tilt mechanism must permit the table to tilt about its center from the horizontal to a position of 15°(75°) measured from the vertical when rotated about the short axis. This tilt, because of the 9" overall height requirement (when in horizontal mode), may require a movable pivot point and assumes that the base is located at the edge of the table to permit the film spools and transport mechanism to extend out into space and clear the supporting surface. In addition, the light table should be able to tilt about its center, from the horizontal to 45° from the vertical when rotated about its long axis. These motions must be smooth, positive and continuously variable. Ball joints, while providing the required flexibility of motion, have not proved successful in the past.

4.5.2. Tilt Lock Mechanism. A positive mechanism must be provided to lock the light table in all possible tilted and horizontal positions. This lock must be activated and deactivated with only a minimum of force and it must not lose its positive locking characteristics because of wear under continuous hard usage.

4.5.3. Electrical Wiring. All electrical wiring between the base and the light table must be carried internally or positioned where it can not be twisted or broken off. This wiring shall not interfere in any manner with the tilting motion of the table.

4.5.4. Balance. The table must be completely stable and remain properly balanced throughout all the possible tilt positions, even with dual 500 foot rolls of 5" film on one end and empty spools on the other.

4.6. Miscellaneous.

4.6.1. Construction. Construction shall meet the highest commercial standards.

4.6.2. Shock Hazard. The unit must be grounded and be free of all shock hazard.

4.6.3. Warning Light. A warning light must be provided to show when the unit is on even if the table light intensity is turned completely down.

4.6.4. Controls. All necessary controls must be provided in locations readily accessible to the operator regardless of the degree of table tilt. Human engineering factors must be thoroughly considered in the design and placement of all necessary controls.